INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP2004/019293

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01M4/86 H01M4/94 H01M8/02 H01M8/04 H01M8/06
H01M8/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 444 339 B1 (ESHRAGHI RAY R) 3 September 2002 (2002-09-03) column 26, line 57 - column 27, line 25 claim 1	1,3,4, 10,12,13
Y		14,15
X	US 5 631 099 A (HOCKADAY ET AL) 20 May 1997 (1997-05-20) column 12, line 59 - column 13, line 2 claims 1-41	1,3,4, 10,13
A	US 2002/020298 A1 (DROST ERNST ET AL) 21 February 2002 (2002-02-21) paragraphs [0009], [0037] - [0039]	1-13

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
5 July 2006	17/07/2006

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Reich, C

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Form PCT/ISA/210 (second sheet) (January 2004)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 197 34 634 C1 (FORSCHUNGSZENTRUM JUELICH GMBH, 52428 JUELICH, DE) 7 January 1999 (1999-01-07) column 3, lines 8-19	1-13
A	US 5 759 712 A (HOCKADAY ET AL) 2 June 1998 (1998-06-02) the whole document	1-13
A	US 2002/048703 A1 (OHLSEN LEROY J ET AL) 25 April 2002 (2002-04-25) paragraphs [0057], [0058]	1-13
Y	PATENT ABSTRACTS OF JAPAN vol. 018, no. 551 (E-1619), 20 October 1994 (1994-10-20) -& JP 06 203861 A (TOSHIBA CORP), 22 July 1994 (1994-07-22) claim 1 paragraphs [0004], [0006], [0007], [0009], [0014], [0021]	14
A	WO 00/39870 A (BALLARD POWER SYSTEMS INC; KNIGHTS, SHANNA, D; WILKINSON, DAVID, P; NE) 6 July 2000 (2000-07-06) page 24, line 31 - page 25, line 3	14
A	US 6 503 650 B1 (YASUO TAKASHI ET AL) 7 January 2003 (2003-01-07) column 8, lines 36-38 column 10, lines 40-51	14
A	US 2003/012986 A1 (KOSCHANY PETRA) 16 January 2003 (2003-01-16) paragraph [0039]	14
Y	DE 195 48 297 A1 (MTU MOTOREN- UND TURBINEN-UNION FRIEDRICHSHAFEN GMBH, 88045 FRIEDRICHS) 26 June 1997 (1997-06-26) claim 1 column 4, lines 55-61	15
A	WO 03/041200 A (BALLARD POWER SYSTEMS AG; BALLARD POWER SYSTEMS INC; KNOOP, ANDREAS; P) 15 May 2003 (2003-05-15) page 4, paragraph 2	15

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Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-13

A fuel cell having a hydrogen permeable metal layer that is formed on a plane of an electrolyte layer that has proton conductivity and includes a hydrogen permeable metal, said fuel cell comprising:
a temperature distribution equalizing portion to equalize an uneven temperature distribution in said fuel cell, wherein the uneven temperature distribution is caused by either or both of operating conditions of said fuel cell and surroundings of said fuel cell.

1.1. claims: 1(part),2,3,10,12(part),13(part)

A fuel cell in accordance with claim 1, wherein the temperature distribution equalizing portion comprises a shift catalyst portion, which is formed to be in contact with an anode inside said fuel cell and contains a shift catalyst of accelerating a shift reaction to produce hydrogen and carbon dioxide from carbon monoxide and steam, and the shift catalyst portion receives a supply of a reformed gas containing hydrogen, carbon monoxide, and steam and has a greater content of the shift catalyst in a specific region corresponding to a lower temperature area, which has a lower temperature than a remaining area due to either or both of the operating conditions of said fuel cell and the surroundings of said fuel cell, than a content of the shift catalyst in a residual region corresponding to the remaining area.

1.2. claims: 1(part),4-9,11,12(part),13(part)

A fuel cell in accordance with claim 1, wherein the temperature distribution equalizing portion controls heat generation in a higher temperature area having a higher temperature than a residual area, due to either or both of the operating conditions of said fuel cell and the surroundings of said fuel cell.

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2. claim: 14

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A fuel cell device (in accordance with claim 1), wherein the temperature distribution equalizing portion comprises a first flow path and a second flow path to supply and discharge the reactive gas into and from said fuel cells; a first switchover element that is provided in the first flow path to make a switchover between a gas intake state of allowing the reactive gas to be fed from a conduit connecting with the first flow path and to be introduced into said fuel cells and a gas discharge state of connecting the first flow path with outside to discharge the reactive gas flowed through said fuel cells to the outside; and a second switchover element that is provided in the second flow path to make a switchover between the gas intake state of allowing the reactive gas to be fed from a conduit connecting with the second flow path and to be introduced into said fuel cells and the gas discharge state of connecting the second flow path with the outside to discharge the reactive gas flowed through said fuel cells to the outside, wherein the first switchover element and the second switchover element are controlled to regulate the flow direction of the reactive gas passing through said fuel cells.

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3. claim: 15

A fuel cell device (in accordance with claim 1), wherein the temperature distribution equalizing portion comprises a reactive gas circulation module that recirculates at least part of a reactive gas exhaust, which is the reactive gas flowed through and discharged from said fuel cells, to the flow of the reactive gas; and a reactive gas temperature decreasing module that decreases temperature of the reactive gas exhaust, prior to recirculation of the reactive gas exhaust to the flow of the reactive gas.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/JP2004/019293

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